Re: PER Drainage design review

[redacted]@gallupsurveyors.com>

Mon 11/11/2013 11:32 AM

To:[redacted]@eaest.com>;

Cc:Sturgeon, Randy <Sturgeon.Randy@epa.gov>; [redacted]@eaest.com>;
[redacted]@advantusstrategies.com <[redacted]@advantusstrategies.com>; [redacted]@salmonsinc.com
[redacted]@salmonsinc.com>;

Categories: PER

1 attachments (3 MB)

PER DITCH STUDY.pdf;

Gentlemen,
See my response to comment 4 below, along with the attachments. Please call or write me if you have any questions.
Thanks-
David Butler

> ----- Original Message -----
> **From:** [redacted]gallupsurveyors.com)
> **Cc:** Sturgeon, Randy (Sturgeon.Randy@epa.gov) ; [redacted] ; [redacted].com) ; [redacted]@salmonsinc.com)
> **Sent:** Wednesday, October 23, 2013 1:55 PM
> **Subject:** PER Drainage design review
>
> [redacted],
>
> EA has reviewed the latest drainage design and calculations for the PER property sent to EA on October 22. EA concurs with the submitted calculations and approach to manage the 100-year runoff from the 3975 Elm Avenue property. However, the pre- versus post-development ponding conditions have still not been quantified along the 3975 Elm Avenue/PER property line to show improvements to drainage conditions (see #4 below). The storm drain plan view layout has not changed since the last submittal but the storm drain pipe sizes have been increased and the pipe inverts have generally been lowered to decrease the water surface elevations in the system during the 100-year rainfall event. Additionally, a TideFlex valve has been added to the outfall of the storm drain system which conveys water from the 3975 Elm Avenue property. The following are EA comments provided to you on October 2 (in black) followed by EA's observations of the revised October 22 submission in red:
>
> 1. The times of concentration for runoff to reach each inlet appear high. This would affect the rainfall intensity, design flow rates, and performance of the system. Please confirm that 20-25 minutes is appropriate for the small drainage areas, especially since much of the area contains impervious surfaces.

The times of concentration have been revised and are appropriate for the drainage area size and land use. Additionally, the runoff coefficients (indicating imperviousness) have been revised to assume the 3975 Elm Avenue property will be fully developed in the future. Previous comment has been satisfied.

2. There appears to be a problem with the hydraulic grade line (HGL) calculations. Many of the computed HGLs are below the pipe inverts (Inlets 7, 6A, 4, 3, 2, 1, and 1A). This may be due to the friction slope used in the HGL calculations which are significantly different from the pipe slopes.

The hydraulic grade line calculations have been revised. The HGLs downstream of the 3975 Elm Avenue property are well below the proposed ground elevation of the PER improvements. HGLs along the 3975 Elm Avenue/PER property boundary are discussed in detail below.

3. Once the HGLs are corrected, it will be important to check the HGL at each manhole/flared end section (FES) along the PER/3975 Elm Avenue property line to make sure water is not ponding along the proposed retaining wall. As a suggestion, it appears that the storm drain could be lowered to accommodate total capture of runoff from the 3975 Elm Avenue property with no backup. See attached "property line" pdf for concept. Please provide similar cross sections at critical points along the retaining wall for review (especially at STMH-4). Mr. [redacted] is concerned with additional flow/velocity along the 3975 Elm Avenue property undercutting the existing concrete pad on his property. A cross section with HGL shown (similar to the attached pdf) may ease those concerns.

The HGL at each manhole/FES along the 3975 Elm Avenue/PER property line are contained within the existing ditch. There are 5 FESs along the property line that collect runoff from the 3975 property ranging in size from 12 inches to 36 inches. Water will pond in the ditch while the storm drain is flowing full during the 100-year storm event up to 1 foot as runoff enters the FESs.

4. Pete met with Mr. [redacted] on 9/24 to discuss drainage patterns of the 3975 Elm Avenue property. Attached is an annotated C2 sheet indicating the drainage patterns on the property as described by Mr. [redacted] and as confirmed during the visit. EA strongly suggests using similar drainage area delineations to the attached annotations to demonstrate to Mr. [redacted] that his concerns have been addressed. Also, Mr. [redacted] is very concerned about the capacity of the ditch between the PER property and his, and he is also very concerned about maintaining positive drainage from this area in the pipe along the swale alignment you are proposing. EA strongly suggests that you perform a pre-development conditions analysis to demonstrate that the proposed PER development will improve the drainage along the PER/3975 Elm Avenue property boundary in the post-development condition. This could be demonstrated through improved water surface elevations and lack of ponding in the ditch between the two properties.

The drainage areas have been revised per EA recommendations and recommended flow patterns have been accounted for. There is ponding in the ditch of up to one foot while runoff enters the storm drain system. Although the system has been designed to collect runoff and convey flows to the outfall effectively, without any significant ponding, it is unknown how this compares to the pre-development condition water surface elevations in the ditch as a pre-development analysis was not performed for comparison. EA still strongly suggests showing a calculation for the pre-development condition runoff and corresponding depth in the property line ditch for comparison to the post-development condition. It is anticipated that a simple flow rate calculation for the 3975 Elm Avenue property and a cross section calculation using Manning's equation would be sufficient to show the pre-development flow depth in the ditch. Additionally, EA recommends adding check dams immediately downstream of each lateral inlet/FES into the main pipeline along the PER/3975 Elm Avenue property boundary to more effectively collect and drain the runoff from the ditch and to reduce the potential of bypass.

Check dams have been added just downstream of flared end sections at structures 1, 1A, 2, and 3. See plan sheets C4 and C5 and detail shown on sheet C7. Calculations for pre and post ponding elavations for two cross sections, A-A and B-B are provided on three 8.2 x 11 sheets. Conclusions on the bottom of sheets 2 and 3 show a lower water surface elevation in the ditch, post developed situation. The ditch in a pre developed state does not have adequate capacity for most of its length. The ditch, altered with the addition of a retaining wall, has capacity and 100 year flows are contained. The reason for the radical difference in pre and post states is most of the water that outfalls to the ditch from the [redacted] side is intercepted by a new flared end section and piped in an storm sewer independent of the PER storm sewer. Additional, some of the overland flows from the PER site are eliminated in the post development state. See 2 attached drainage area maps. The [redacted] water is piped and outfalls in the upper reaches of the current ditch and because of lack of slope and the general geometry of the trapazoidal ditch, it does not have capacity for the design storm in its existing predeveloped state. If and when the [redacted] tract is developed, PER will have provided a storm sewer to accommodate 100 year (quanity, not quality) flows from the [redacted] site.

Please let [redacted] or myself know if you have any further questions.

[redacted]

PRE DEVELOPMENT CALCULATIONS FOR BOUNDARY DITCH

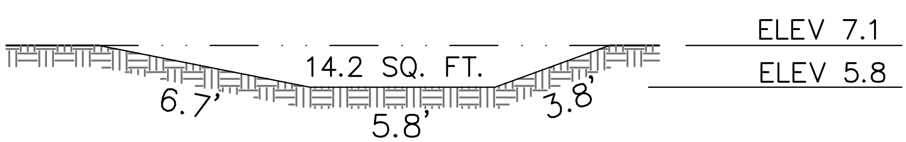
CHECK WATER SURFACE ELEVATION OF EXISTING DITCH BETWEEN PER AND DIXON: THE WATER SURFACE ELEVATION WILL BE CHECKED AT VARIOUS LOCATIONS ALONG THE RECENTLY CUT PERIMETER DITCH BASED ON FLOWS FROM A PRE DEVELOPMENT STAGE. THE DIXON PROPERTY HAD A DITCH IN THE SAME GENERAL LOCATION PRIOR TO PER PURCHASING THE PROPERTY AND THAT DITCH IS DEPICTED ON THE STEVE BOONE TOPOGRAPHIC SURVEY. SHORTLY AFTER PER PURCHASED AND CLEARED THE PROPERTY, A NEW TRAPAZOIDAL DITCH WAS CUT. THIS DRAINAGE ANALYSIS WILL ATTEMPT TO DETERMINE THE WATER SURFACE ELEVATION IN THE RECENTLY CUT TRAPAZOIDAL DITCH BASED ON A PRE DEVELOPMENT STATE.

PER PLANS ON INSTALLING A RETAINING WALL ON THE PER SIDE, 36" EAST OF THE COMMON BOUNDARY LINE. INSTALLING THE WALL WILL ALTER THE CROSS SECTIONAL GEOMETRY OF THE TRAPAZOIDAL DITCH. CALCULATIONS WILL BE PERFORMED TO DETERMINE THE WATER SURFACE ELEVATION OF THE ALTERED DITCH BASED ON POST DEVELOPMENT CONDITIONS.

SECTION A—A SHOWN ON PRE DEVELOPMENT DRAINAGE AREA MAP:

TOTAL DRAINAGE AREA: 135,343 S.F.=3.1070 ACRES
PERVIOUS AREA @ C FACTOR=0.2, 37,539 S.F.=0.8618 ACRES; CA=0.1724
PERVIOUS AREA @ C FACTOR=0.3, 42,388 S.F.=0.9731 ACRES; CA=0.2919
IMPERVIOUS AREA @ C FACTOR=0.9, 55,416 S.F.=1.2722 ACRES; CA=1.1450
SUM OF THE CA's=1.6093; C=0.5179

TIME OF CONCENTRATION:
200 L.F. OF OVERLAND FLOW @ 1.5% = 22.5 MINS
151 L.F. OF CHANNEL FLOW @ 1.5 FPS = 1.7 MINS
SUM Tc = 24.2 MINS
I100 = 285.2/24.7+24.2 = 5.83 IN/HR.
110 = 201/23.9+24.2 = 4.18 IN/HR.
Q100=1.6093 X 5.83 = 9.4 CFS
Q10=1.6093 X 4.18 = 6.7 CFS



SECTION A—A

WP=6.7+5.8+3.8=16.3'
XS AREA=14.2 S.F.
R=A/WP = 14.2/16.3 = 0.87
N FACTOR FOR LINING=0.45
SLOPE OF DITCH=0.005 FT/FT

$Q=1.486/N \times A \times R^{0.67} \times S^{0.50}$ EQUALS DITCH CAPACITY
Q CAPACITY=3.02<<6.7 OR 9.4 CFS

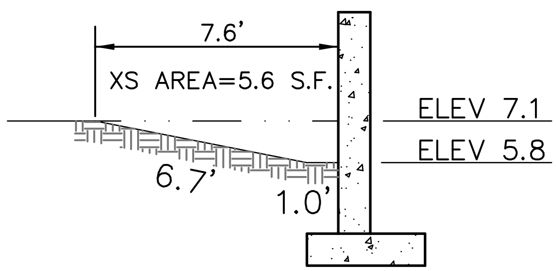
WATER SURFACE ELEVATION AT SECTION A—A IS 7.1 SINCE IT IS NOT CONTAINED WITHIN THE GEOMETRY OF THE DITCH SECTION.

POST DEVELOPMENT CALCULATIONS FOR BOUNDARY DITCH

SHEET 2 OF 3
11/9/13

NOTE:
END SECTION AT STMH–1 TAKES IN 1.93 ACRES FROM THE DIXON TRACT PIPE OUTFALLING AT THAT LOCATION. 1.93 ACRES WILL NO LONGER FLOW THROUGH THE DITCH, BUT WILL BE INTERCEPTED BY THE NEW PER STORM DRAIN AT STMH–1

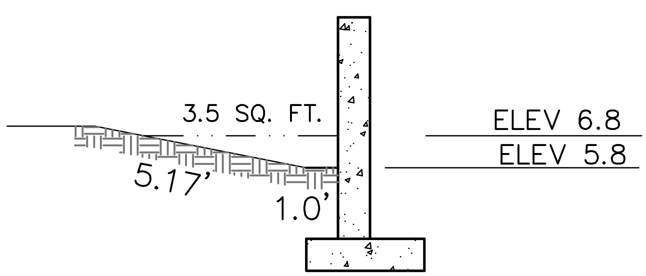
AREAS DRAINING TO THE DITCH AT AND UPSTREAM OF SECTION A–A
3199 S.F. = 0.0734 AC. X 0.5 = CA = 0.0367
1672 S.F. = 0.0384 AC X 0.5 = CA = 0.0192
SUM CA's: 0.0559
Tc=5 MINS, I100=28502/24.7+5 = 9.60 IN./HR.
Q100=0.0559 X 9.6 = 0.54 CFS



SECTION A–A

WP=6.7+1.0=7.7
XS AREA=5.6 S.F.
R=A/WP = 5.6/7.7 = 0.73
N FACTOR FOR LINING=0.45
SLOPE OF DITCH=0.005 FT/FT

$Q_{CAPACITY} = 1.486/N \text{ X } A \text{ X } R^{0.67} \text{ X } S^{0.50}$ = 1.05 CFS AT FULL DEPTH OF 1.3'



WATER DEPTH OF WATER=12": (ELEV 6.80)

WP=5.17+1.0=6.17
XS AREA=3.54 S.F.
R=A/WP = 3.54/6.17 = 0.57
N FACTOR FOR LINING=0.45
SLOPE OF DITCH=0.005 FT/FT

HW ELEV. FROM PIPE CALCULATION SHEET LD–269 SHOWS A HEADWATER ELEV. OF 6.67
6.80 > 6.67; CONTROLLING ELEV=6.80

$Q_{CAPACITY} = 1.486/N \text{ X } A \text{ X } R^{0.67} \text{ X } S^{0.50}$ = 0.56 CFS, APPROX. = TO 0.54 CFS

CONCLUSION:
THE 100 YEAR STORM ON A PRE DEVELOPED CONDITION IS NOT CONTAINED IN THE EX. DITCH SECTION AND WILL REACH A MIN. ELEVATION OF 7.1 (TOP OF DITCH BANK); SINCE WATER IS REMOVED FROM THE DITCH VIA ONSITE GRADING AND WITH THE ADDITION OF A FES AT STMH–1, THE WATER SURFACE PROFILE ELEVATION IS LOWER AT POST DEVELOPED CONDITIONS.

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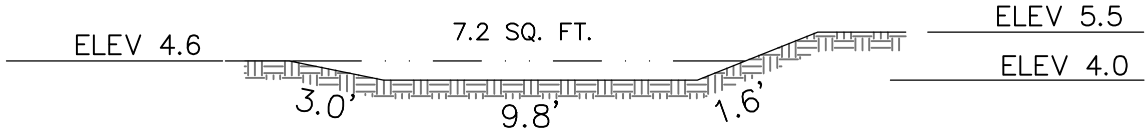
PRE DEVELOPMENT CALCULATIONS FOR BOUNDARY DITCH

AREAS:
3.107 AC. AT C=0.5179, CA=1.6091
1.2495 AC. AT C=0.25; CA=0.3123
SUM CA's = 1.9214
TIME OF CONCENTRATION:
OVERLAND FLOW TIME=22.5 MINS
CHANNEL TIME. 626 L.F. @ 1.5 FPS=6.95 MINS
SUM Tc = 29.45 mins
1100=285.2/24.7+29.45 = 5.26 IN./HR.
Q100=1.9214 X 5.26 = 10.1 CFS

AVE DITCH SLOPE FROM XS A TO XS B: 5.9–4.7/475' = 0.0025 FT/FT
XS AREA TO ELEV. 4.6 = 7.2 S.F.
WP=3.0+9.8+1.6=14.4'
R=7.2/14.4=0.50
N FACTOR FOR LINING=0.45

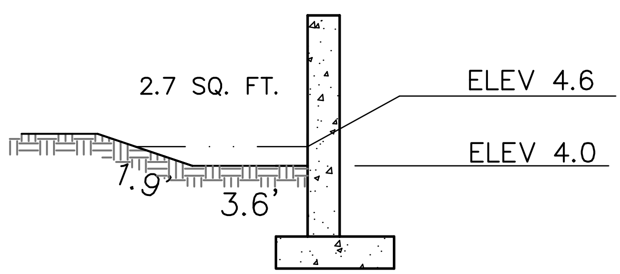


SECTION B–B

$Q=1.486/N \times A \times R^{0.67} \times S^{0.50}$ EQUALS DITCH CAPACITY
Q CAPACITY=0.74<<10.1 CFS

DESIGN STORM ON A PRE DEVELOPED CONDITION
IS NOT CONTAINED IN THE DITCH GEOMETRY

POST DEVELOPMENT CALCULATIONS FOR BOUNDARY DITCH



SECTION B–B

AREA DRAINING TO XS–B:
1514 S.F.=0.0347 AC.
C=0.50
CA=0.0173
Tc=5 MINS, I100=9.60 IN/HR
Q100=0.17 CFS

N FACTOR FOR LINING=0.45
AVG. DITCH SLOPE FROM XS A TO XS B: 5.9–4.7/475' = 0.0025 FT/FT
XS AREA TO ELEV. 4.6 = 2.7 S.F.
WP=1.9'+3.6'=5.5'
R=2.7/5.5=0.49
$Q=1.486/N \times A \times R^{0.67} \times S^{0.50}$ EQUALS DITCH CAPACITY
Q CAPACITY=0.28 CFS

CONCLUSION:
Q100 POST DEVELOPMENT=0.17 CFS
DITCH CAPACITY=0.28 CFS
WATER SURFACE ELEV. WILL BE LESS THAN TOP OF BANK ELEV OF 4.6
WATER SURFACE ELEV BEFORE DEVELOPMENT IS AT TOP OF BANK ELEV OF 4.6
SINCE THE STORM IS NOT CONTAINED.

PRE DEVELOPMENT DRAINAGE MAP

PORTSMOUTH TERMINAL FACILITY

PROJECT LOCATED IN: VIRGINIA BEACH, VIRGINIA	MADE FOR: PER PROPERTIES
DESIGN BY: BWG DRAWN BY: JB CHECKED BY: BWG	DATE: OCTOBER 2, 2013
GALLUP SURVEYORS & ENGINEERS, LTD. 323 FIRST COLONIAL ROAD VIRGINIA BEACH, VIRGINIA 23454 (757)428-8132 (757)425-2390 FAX	SCALE: 1" = 60" FILE NO.: . SHEET 3/13 C3

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DRAINAGE STRUCTURE SCHEDULE

1A. STMH
RIM 10.50
INV 4.37

1. STMH
RIM 10.50
INV 4.24

2. STMH
RIM 10.50
INV 4.04

3. STMH
RIM 10.50
INV 3.73

4. STMH
RIM 8.20
INV (N) 3.51
INV (E) −0.14
INV (W) 2.50

5. STMH
RIM 10.20
INV −0.37

6. DI
RIM 9.40
INV (E) −0.58
INV (W) 1.87
INV (S) 3.41

7. STMH
RIM 10.50
INV −0.86

5A. DI
RIM 9.10
INV 5.09

10A. DI
RIM 9.80
INV 4.25

8. STMH
RIM 10.50
INV −1.05

10. DI
RIM 9.80
INV 4.77

11. DI
RIM 9.80
INV 3.73

12. STMH
RIM 10.40
INV 3.33

12A. DI
RIM 9.50
INV 3.13

13. DI
RIM 9.35
INV 2.49 (E,W,S)
INV 7.29 (N)

14. DI
RIM 9.35
INV 2.96

15. DI
RIM 9.35
INV 3.23

7A. DI
RIM 9.50
INV (N,S) 2.00
INV (E) 4.00

8A. RIM 9.60
INV 3.44

9A. RIM 9.35
INV 4.09

6A. RIM 9.80
INV −0.57

NOTES:

THE SILT SACK PRODUCT SHOWN ON SHEET C7 IS TO BE USED IN ALL STORM DRAIN INLETS AND IS TO REMAIN PERMANENT FOR DRAINAGE STRUCTURES 7A, 8A, 9A, AND 13.

THE INVERTS SHOWN ON THE DROP INLET DENOTES THE INVERT OF THE PIPES. PROVIDE A 12" DEEP SUMP (BELOW THE PIPE INVERT) ON THE DROP INLETS FOR MAINTENANCE PURPOSES FOR STRUCTURES 7A, 8A, 9A, AND 13.

O.W. DENOTES REQUIRED OBSERVATION WELLS; SEE DETAIL ON SHEET C9.

ALL DRAINAGE STRUCTURES ARE TO RECEIVE INLET SHAPING.
FINAL SURFACE WILL BE GRAVEL AND CRUSHED CONCRETE

PIPE SCHEDULE

10–10A
208'–24" HDPE @ 0.25%
INV IN 4.77, INV OUT 4.25

10A–11
207'–24" HDPE @ 0.25%
INV IN 4.25, INV OUT 3.73

11–12
198'–24" HDPE @ 0.20%
INV IN 3.73, INV OUT 3.33

12–12A
59'–24" HDPE @ 0.34%
INV IN 3.33, INV OUT 3.13

12A–13
191'–24" HDPE @ 0.34%
INV IN 3.13, INV OUT 2.49

RR–13
117'–12" HDPE @ 1.03%
INV IN 8.50, INV OUT 7.29

9A–8A
109'–18" PERFORATED HDPE @ 0.60%
INV IN 4.09, INV OUT 3.44

15–14
89'–18" HDPE @ 0.30%
INV IN 3.23, INV OUT 2.96

14–13
196'–24" HDPE @ 0.24%
INV IN 2.96, INV OUT 2.49

13–7A
215'–18" PERFORATED HDPE @ 0.23%
INV IN 2.49, INV OUT 2.00

7A–6
344'–36" CL. IV RCP @ 0.62%
INV IN 4.00, INV OUT 1.87

8A–7A
215'–24" CL. IV RCP @ 0.67%
INV IN 3.44, INV OUT 2.00

5A–6
330'–15" HDPE @ 0.51%
INV IN 5.09, INV OUT 3.41

6–OUTLET
144' 42" HDPE @ 0.50%
INV IN −0.58, INV OUT −1.30
PROVIDE TIDEFLEX TF–1
ON OUTLET END

4–5
150'–36" HDPE @ 0.15%
INV IN −0.14, INV OUT −0.37

5–6A
154'–36" HDPE @ 0.13%
INV IN −0.37, INV OUT −0.57

6A–7
220'–36" HDPE @ 0.13%
INV IN −0.57, INV OUT −0.86

7–8
158'–36" HDPE @ 0.12%
INV IN −0.86, INV OUT −1.05

8–OUTLET
152'–36" HDPE @ 0.12%
INV IN −1.05, INV OUT −1.23
PROVIDE TIDEFLEX TF–1
ON OUTLET END

1A–1
134'–12" HDPE @ 0.10%
INV IN 4.36, INV OUT 4.23

1–2
119'–30" HDPE @ 0.17%
INV IN 4.23, INV OUT 4.04

2–3
204'–30" HDPE @ 0.15%
INV IN 4.04, INV OUT 3.73

3–4
156'–30" HDPE @ 0.15%
INV IN 3.73, INV OUT 3.50

AT STMH–2:
10'–18" HDPE WITH 18" FES
INV IN 5.50, INV OUT 4.04

AT STMH–4:
6'–36" HDPE WITH 36" FES
INV IN 2.85, INV OUT 2.50

AT STMH–3:
10'–18" HDPE WITH 18" FES
INV IN 4.80, INV OUT 3.73

AT STMH–1A:
10'–12" HDPE WITH 12" FES
INV IN 5.90, INV OUT 4.36

AT STMH–1:
10'–30" HDPE WITH 30" FES
INV IN 5.80, INV OUT 4.23

NOTE:
ALL BUILDING STRUCTURES ARE FUTURE AND ARE TO BE APPROVED SEPARATELY.

0' 60' 120' 180'

DATE	COMMENT

REVISION SCHEDULE

POST DEVELOPMENT DRAINAGE MAP

PORTSMOUTH TERMINAL FACILITY

PROJECT LOCATED IN: VIRGINIA BEACH, VIRGINIA		MADE FOR: PER PROPERTIES
DESIGN BY: BWG	DRAWN BY: JB	CHECKED BY: BWG
DATE: OCTOBER 2, 2013		
SCALE: 1" = 60'	SHEET 3/13	C3
FILE NO.: .		

GALLUP
SURVEYORS & ENGINEERS, LTD.
323 FIRST COLONIAL ROAD
VIRGINIA BEACH, VIRGINIA 23454
(757)428–8132 (757)425–2390 FAX

PIPE SCHEDULE

10–10A
208'–24" HDPE @ 0.25%
INV IN 4.77, INV OUT 4.25

10A–11
207'–24" HDPE @ 0.25%
INV IN 4.25, INV OUT 3.73

11–12
198'–24" HDPE @ 0.20%
INV IN 3.73, INV OUT 3.33

12–12A
59'–24" HDPE @ 0.34%
INV IN 3.33, INV OUT 3.13

12A–13
191'–24" HDPE @ 0.34%
INV IN 3.13, INV OUT 2.49

RR–13
117'–12" HDPE @ 1.03%
INV IN 8.50, INV OUT 7.29

9A–8A
109'–18" PERFORATED HDPE @ 0.60%
INV IN 4.09, INV OUT 3.44

15–14
89'–18" HDPE @ 0.30%
INV IN 3.23, INV OUT 2.96

14–13
196'–24" HDPE @ 0.24%
INV IN 2.96, INV OUT 2.49

13–7A
215'–18" PERFORATED HDPE @ 0.23%
INV IN 2.49, INV OUT 2.00

7A–6
344'–36" CL. IV RCP @ 0.62%
INV IN 4.00, INV OUT 1.87

8A–7A
215'–24" CL. IV RCP @ 0.67%
INV IN 3.44, INV OUT 2.00

5A–6
330'–15" HDPE @ 0.51%
INV IN 5.09, INV OUT 3.41

6–OUTLET
144' 42" HDPE @ 0.50%
INV IN –0.58, INV OUT –1.30
PROVIDE TIDEFLEX TF–1
ON OUTLET END

4–5
150'–36" HDPE @ 0.15%
INV IN –0.14, INV OUT –0.37

5–6A
154'–36" HDPE @ 0.13%
INV IN –0.37, INV OUT –0.57

6A–7
220'–36" HDPE @ 0.13%
INV IN –0.57, INV OUT –0.86

7–8
158'–36" HDPE @ 0.12%
INV IN –0.86, INV OUT –1.05

8–OUTLET
152'–36" HDPE @ 0.12%
INV IN –1.05, INV OUT –1.23
PROVIDE TIDEFLEX TF–1
ON OUTLET END

1A–1
134'–12" HDPE @ 0.10%
INV IN 4.36, INV OUT 4.23

1–2
119'–30" HDPE @ 0.17%
INV IN 4.23, INV OUT 4.04

2–3
204'–30" HDPE @ 0.15%
INV IN 4.04, INV OUT 3.73

3–4
156'–30" HDPE @ 0.15%
INV IN 3.73, INV OUT 3.50

AT STMH–2:
7'–18" HDPE WITH 18" FES
(LENGTH INCLUDES FES)
INV IN 5.50, INV OUT 4.04

AT STMH–4:
6'–36" HDPE WITH 36" FES
(LENGTH INCLUDES FES)
INV IN 2.85, INV OUT 2.50

AT STMH–3:
7'–18" HDPE WITH 18" FES
(LENGTH INCLUDES FES)
INV IN 4.80, INV OUT 3.73

AT STMH–1A:
8.5'–12" HDPE WITH 12" FES
(LENGTH INCLUDES FES)
INV IN 5.90, INV OUT 4.36

AT STMH–1:
6'–30" HDPE WITH 30" FES
(LENGTH INCLUDES FES)
INV IN 5.80, INV OUT 4.23

MATCH LINE SEE SHEET C5

DRAINAGE STRUCTURE SCHEDULE

1A. STMH
RIM 10.50
INV 4.36

1. STMH
RIM 10.50
INV 4.23

2. STMH
RIM 10.50
INV 4.04

3. STMH
RIM 10.50
INV 3.73

4. STMH
RIM 8.20
INV (N) 3.50
INV (E) –0.14
INV (W) 2.50

5. STMH
RIM 10.20
INV –0.37

6. DI
RIM 9.40
INV (E) –0.58
INV (W) 1.87
INV (S) 3.41

7. STMH
RIM 10.50
INV –0.86

5A. DI
RIM 9.10
INV 5.09

10A. DI
RIM 9.80
INV 4.25

8. STMH
RIM 10.50
INV –1.05

10. DI
RIM 9.80
INV 4.77

11. DI
RIM 9.80
INV 3.73

12. STMH
RIM 10.40
INV 3.33

12A. DI
RIM 9.50
INV 3.13

13. DI
RIM 9.35
INV 2.49 (E,W,S)
INV 7.29 (N)

14. DI
RIM 9.35
INV 2.96

15. DI
RIM 9.35
INV 3.23

7A. DI
RIM 9.50
INV (N,S) 2.00
INV (E) 4.00

8A. RIM 9.60
INV 3.44

9A. RIM 9.35
INV 4.09

6A. RIM 9.80
INV –0.57

NOTES:

THE SILT SACK PRODUCT SHOWN ON SHEET C7 IS TO BE USED IN ALL STORM DRAIN INLETS AND IS TO REMAIN PERMANENT FOR DRAINAGE STRUCTURES 7A, 8A, 9A, AND 13.

THE INVERTS SHOWN ON THE DROP INLET DENOTES THE INVERT OF THE PIPES. PROVIDE A 12" DEEP SUMP (BELOW THE PIPE INVERT) ON THE DROP INLETS FOR MAINTENANCE PURPOSES FOR STRUCTURES 7A, 8A, 9A, AND 13.

O.W. DENOTES REQUIRED OBSERVATION WELLS; SEE DETAIL ON SHEET C9.

ALL DRAINAGE STRUCTURES ARE TO RECEIVE INLET SHAPING.

SURFACE AREA OF THE SITE WILL BE GRAVEL

0' 30' 60' 90'

COMMONWEALTH OF VIRGINIA
DAVID R. BUTLER
Lic. No. 38395
10/2/13
PROFESSIONAL ENGINEER

GRADING PLAN AND UTILITY PLAN
PORTSMOUTH TERMINAL FACILITY

PROJECT LOCATED IN: VIRGINIA BEACH, VIRGINIA		MADE FOR: PER PROPERTIES	
DESIGN BY: BWG	DRAWN BY: JB	CHECKED BY: BWG	DATE: OCTOBER 2, 2013
GALLUP SURVEYORS & ENGINEERS, LTD. 323 FIRST COLONIAL ROAD VIRGINIA BEACH, VIRGINIA 23454 (757)428–8132 (757)425–2390 FAX		SCALE: 1" = 30'	SHEET 4/13 C4
		FILE NO.:	

GRADING PLAN AND UTILITY PLAN

PORTSMOUTH TERMINAL FACILITY

PROJECT LOCATED IN: VIRGINIA BEACH, VIRGINIA		MADE FOR: PER PROPERTIES	
DESIGN BY: BWG	DRAWN BY: JB	CHECKED BY: BWG	DATE: OCTOBER 2, 2013
GALLUP SURVEYORS & ENGINEERS, LTD. 323 FIRST COLONIAL ROAD VIRGINIA BEACH, VIRGINIA 23454 (757)428-8132 (757)425-2390 FAX		SCALE: 1" = 30'	SHEET 5/13 C5
		FILE NO.:	

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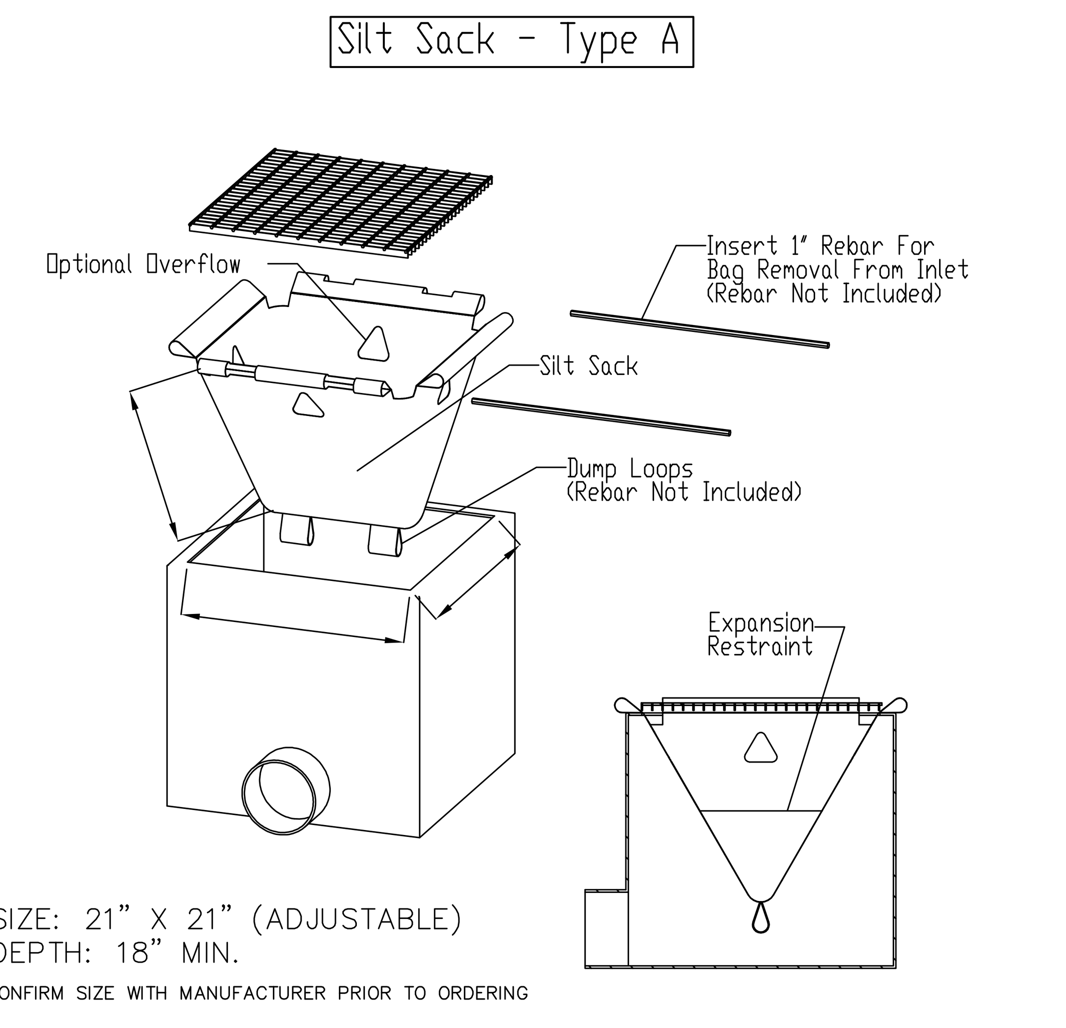


SIZE: 21" X 21" (ADJUSTABLE)
DEPTH: 18" MIN.
CONFIRM SIZE WITH MANUFACTURER PRIOR TO ORDERING

MAINTENANCE SCHEDULE FOR SILTSACK:

1. EACH SILTSACK SHOULD BE INSPECTED AFTER EVERY MAJOR STORM EVENT
2. IF THERE HAVE BEEN NO MAJOR STORM EVENTS, SILTSACK SHOULD BE INSPECTED EVERY 2-3 WEEKS.
3. THE YELLOW RESTRAINT CORD SHOULD BE VISIBLE AT ALL TIMES. IF THE CORD IS COVERED WITH SEDIMENT, THE SILTSACK SHOULD BE EMPLIED.

SUPPLIER:
ACF ENVIRONMENTAL, INC.
2831 CARDWELL ROAD
RICHMOND, VA. 23234
PH. 800-448-3636

3.0 Construction Sequence

3.1 General

3.1.1 To install Siltsack in the catch basin, remove the grate and place the sack in the opening. Hold approximately six inches of the sack outside the frame. This is the area of the lifting straps. Replace the grate to hold the sack in place.

3.1.2 When the restraint cord is no longer visible, Siltsack is full and should be emptied.

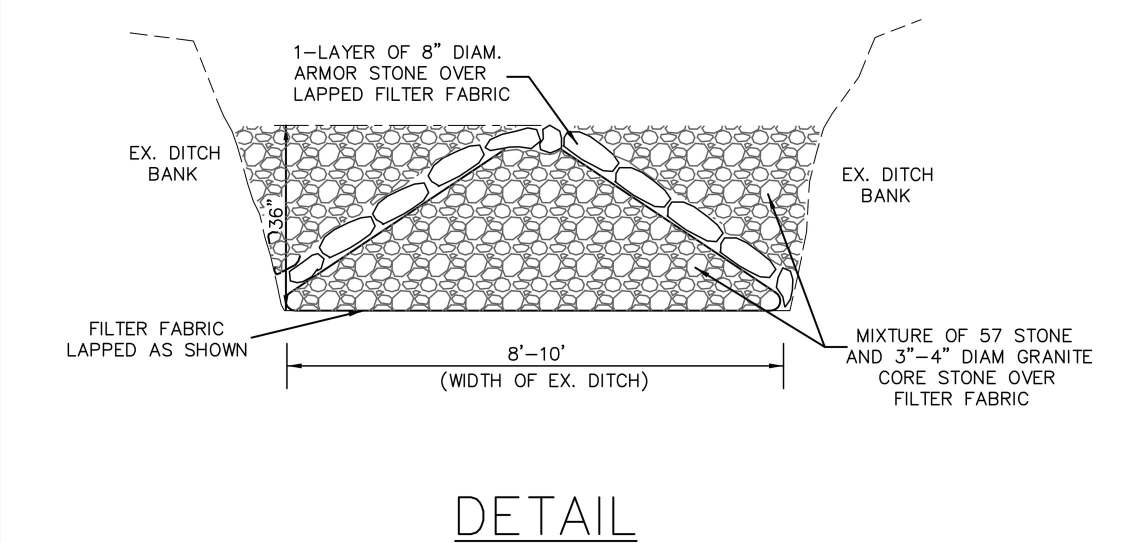
3.1.3 To remove Siltsack, take two pieces of 1" diameter rebar and place through the lifting loops on each side of the sack to facilitate the lifting of Siltsack.

3.1.4 To empty Siltsack, place unit where the contents will be collected. Place the rebar through the lift straps (connected to the bottom of the sack) and lift. This will lift Siltsack from the bottom and empty the contents. Clean out and rinse. Return Siltsack to its original shape and place back in the basin.

3.1.5 Siltsack is reusable. Once the construction cycle is complete, remove Siltsack from the basin and clean. Siltsack should be stored out of sunlight until next use.

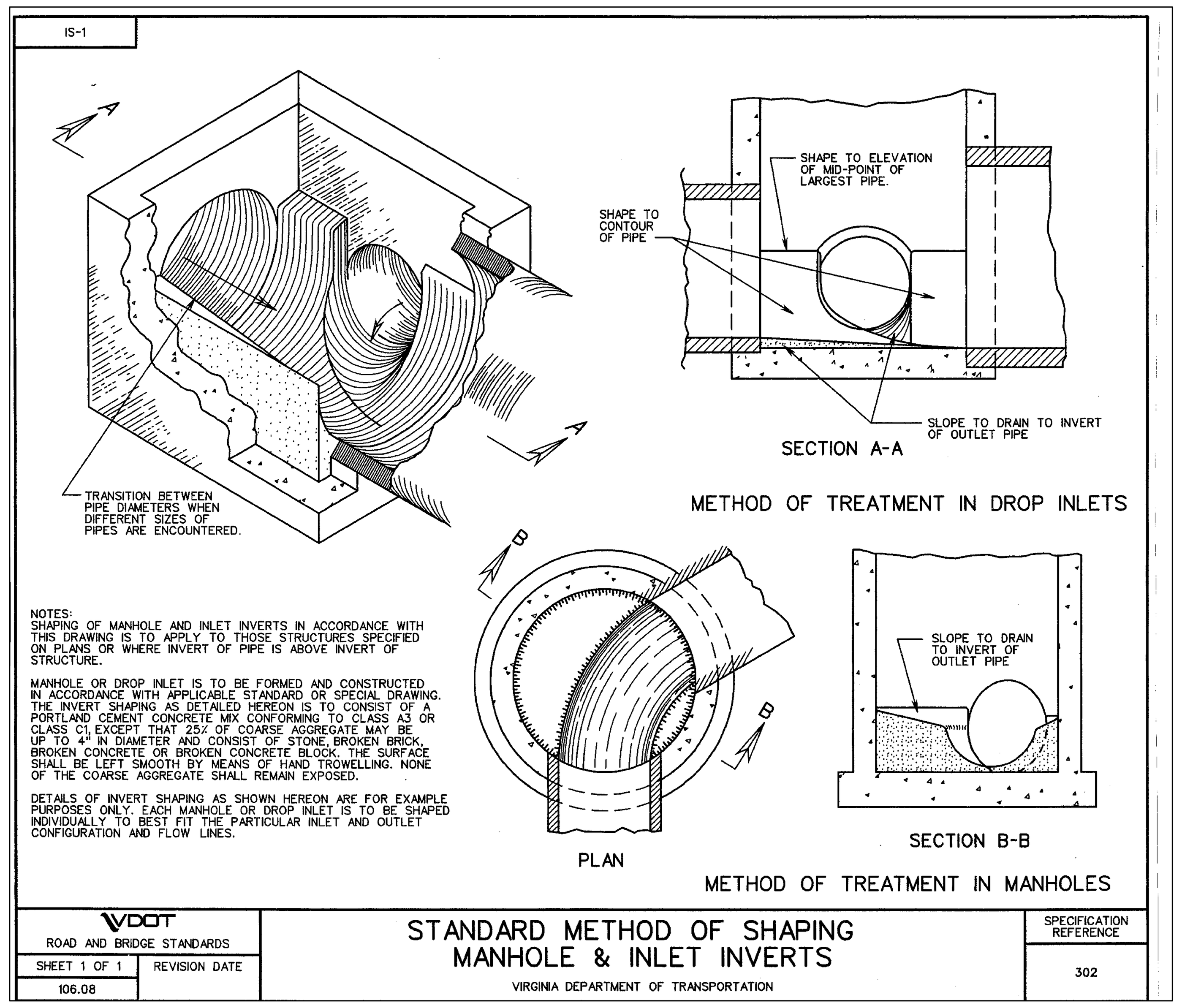
SILTSACK DETAIL

THE SILT SACK PRODUCT SHOWN ON THIS SHEET TO BE USED IN ALL STORM DRAIN INLETS AND IS TO REMAIN PERMANENT FOR DRAINAGE STRUCTURES 12-22



DETAIL

CHECK DAM AT SW CORNER OF BOUNDARY
(NO SCALE)



NOTES:
SHAPING OF MANHOLE AND INLET INVERTS IN ACCORDANCE WITH THIS DRAWING IS TO APPLY TO THOSE STRUCTURES SPECIFIED ON PLANS OR WHERE INVERT OF PIPE IS ABOVE INVERT OF STRUCTURE.

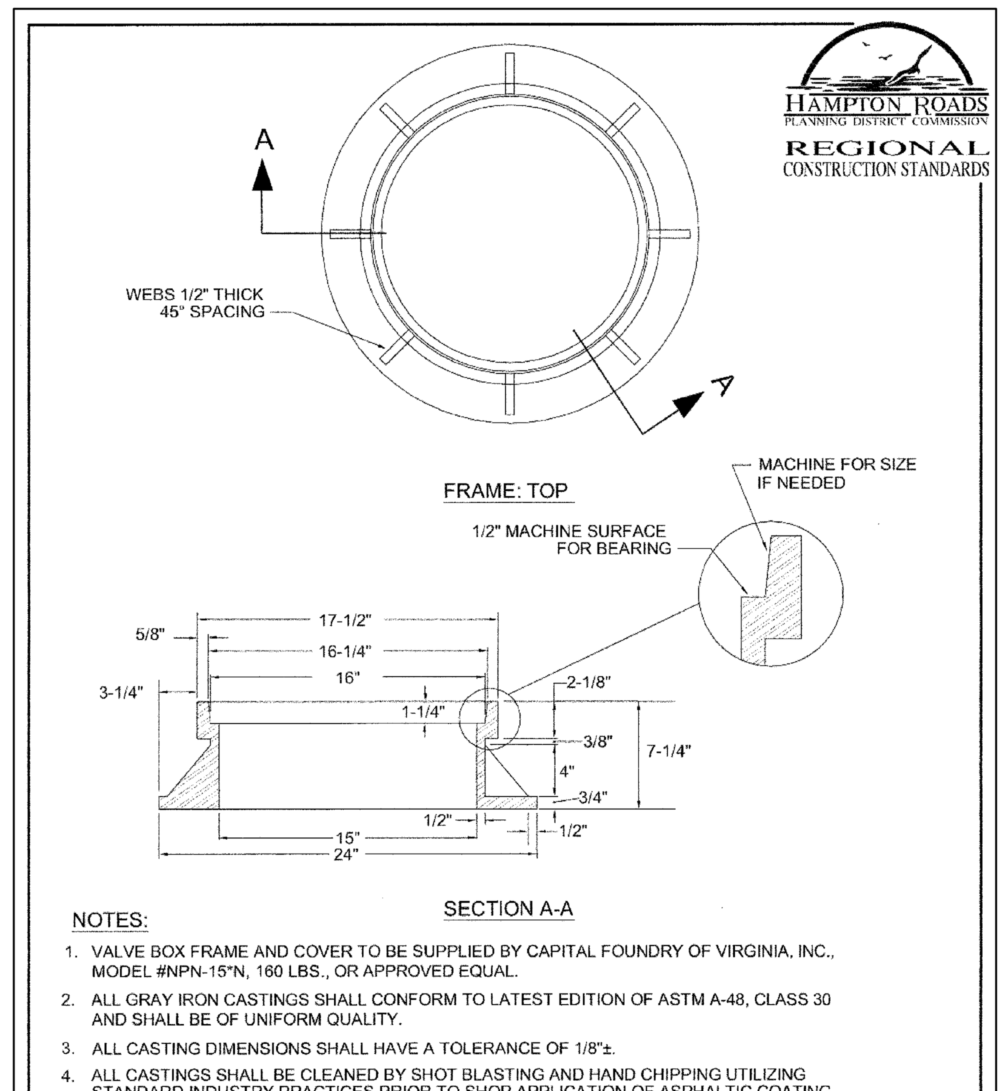
MANHOLE OR DROP INLET IS TO BE FORMED AND CONSTRUCTED IN ACCORDANCE WITH APPLICABLE STANDARD OR SPECIAL DRAWING. THE INVERT SHAPING AS DETAILED HEREON IS TO CONSIST OF A PORTLAND CEMENT CONCRETE MIX CONFORMING TO CLASS A3 OR CLASS C1 EXCEPT THAT 25% OF COARSE AGGREGATE MAY BE UP TO 4" IN DIAMETER AND CONSIST OF STONE, BROKEN BRICK, BROKEN CONCRETE OR BROKEN CONCRETE BLOCK. THE SURFACE SHALL BE LEFT SMOOTH BY MEANS OF HAND TROWELLING. NONE OF THE COARSE AGGREGATE SHALL REMAIN EXPOSED.

DETAILS OF INVERT SHAPING AS SHOWN HEREON ARE FOR EXAMPLE PURPOSES ONLY. EACH MANHOLE OR DROP INLET IS TO BE SHAPED INDIVIDUALLY TO BEST FIT THE PARTICULAR INLET AND OUTLET CONFIGURATION AND FLOW LINES.

VDOT ROAD AND BRIDGE STANDARDS | SHEET 1 OF 1 | REVISION DATE 106.08

STANDARD METHOD OF SHAPING MANHOLE & INLET INVERTS
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 302

ALL DRAINAGE STRUCTURES ARE TO RECEIVE INLET SHAPING WITH THE EXCEPTION OF STRUCTURES 12-22.

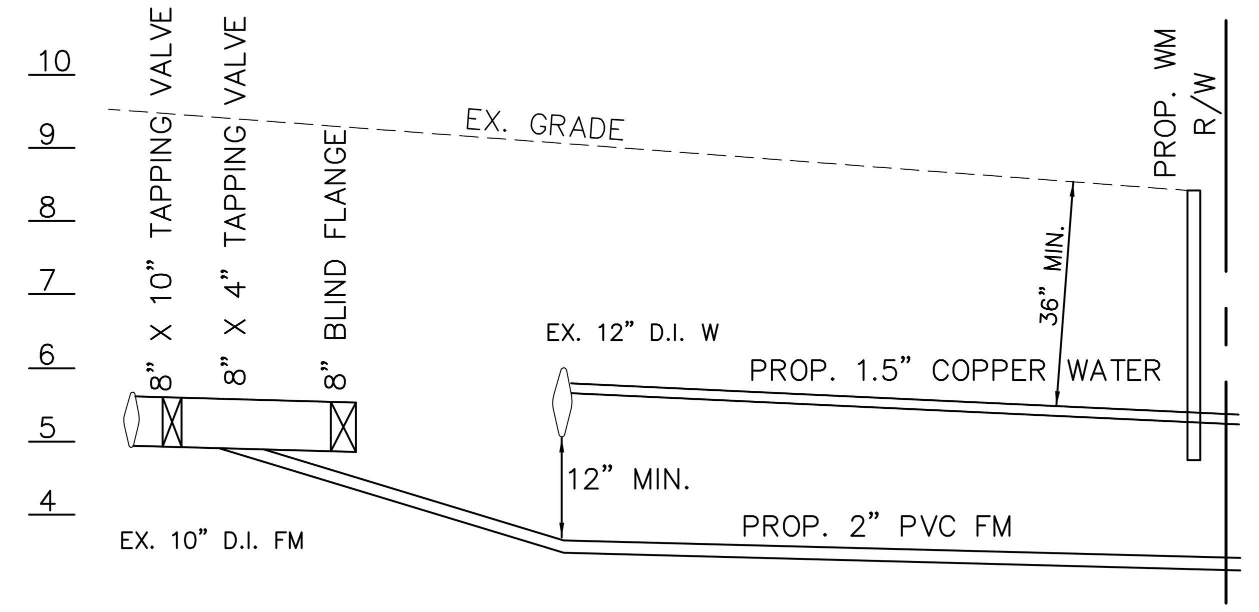


NOTES:

1. VALVE BOX FRAME AND COVER TO BE SUPPLIED BY CAPITAL FOUNDRY OF VIRGINIA, INC., MODEL #NPN-15"N, 160 LBS., OR APPROVED EQUAL.
2. ALL GRAY IRON CASTINGS SHALL CONFORM TO LATEST EDITION OF ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
3. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
4. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING UTILIZING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.

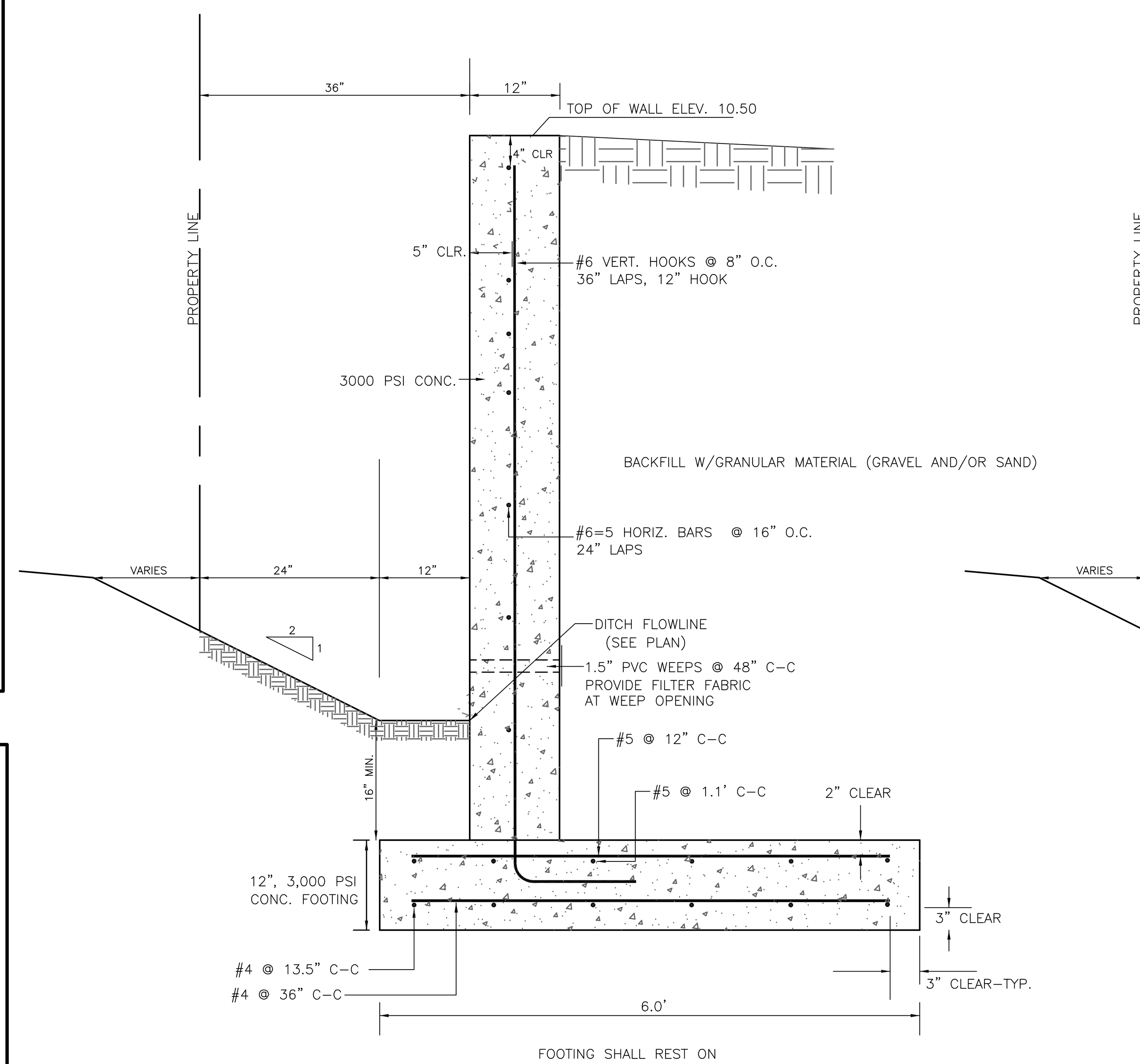
STANDARD VALVE BOX FRAME AND COVER
NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET NO.	DETAIL NO.
200,801,803	WATER & SANITARY	12/10	2 OF 2	WS_01

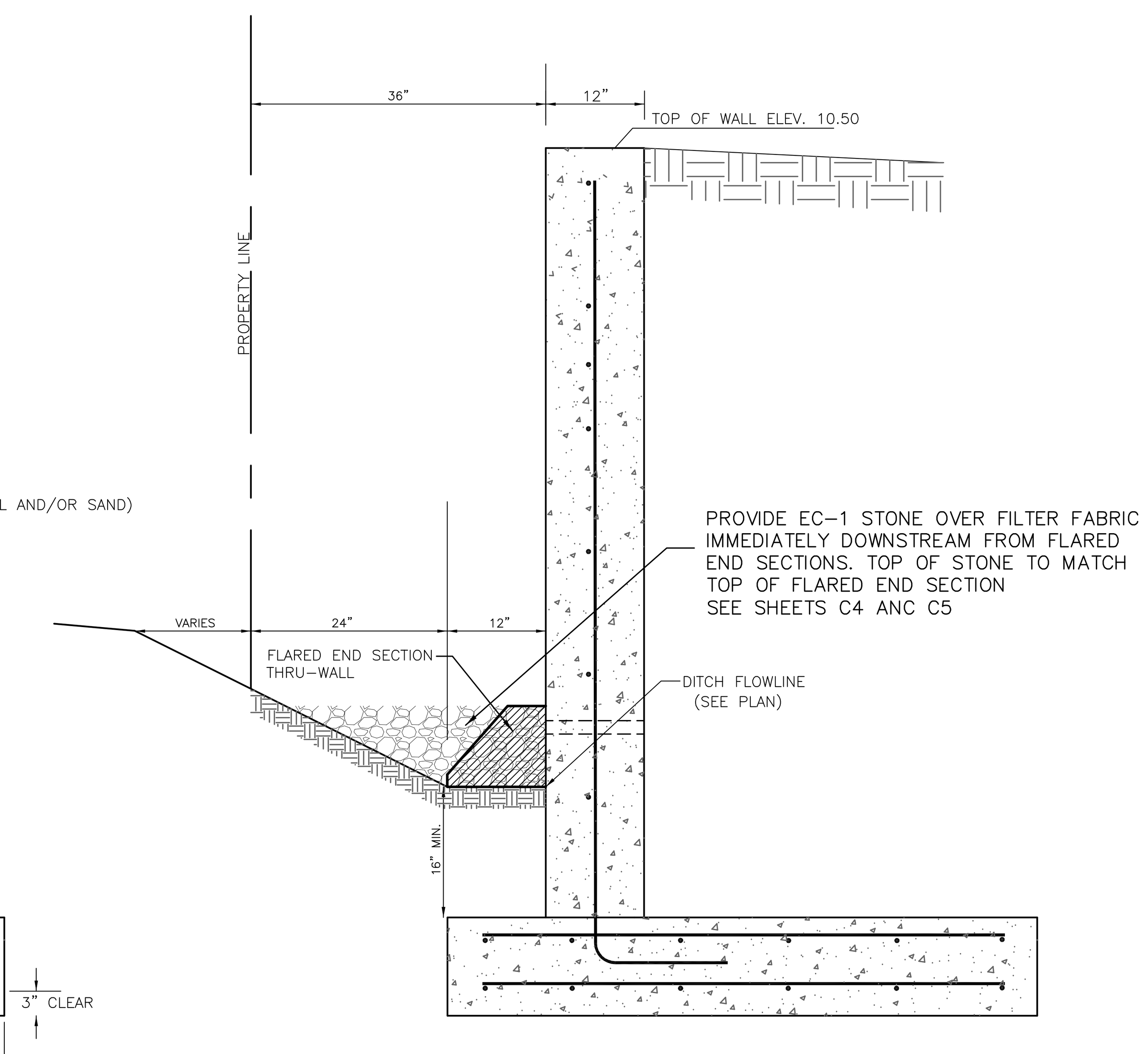


PROFILE:
FM AND WATER SERVICE CONNECTION

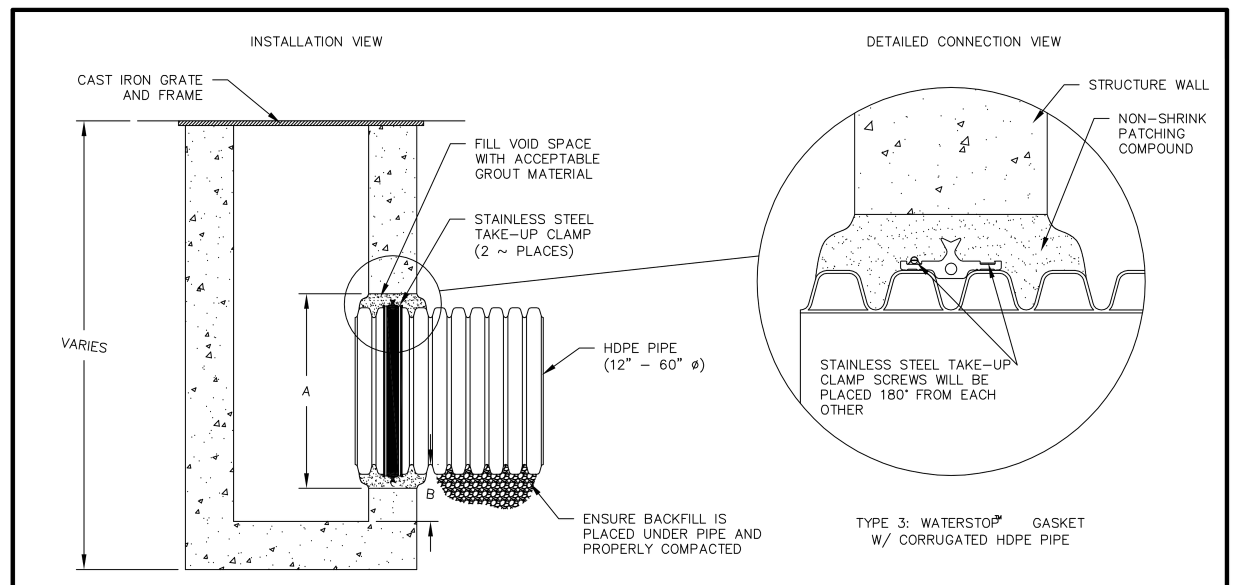
SCALE: 1" = 2' HORIZ.
1" = 2' VERT.



TYPICAL SECTION ALONG WEST PROPERTY LINE
(NO SCALE)



TYPICAL SECTION ALONG WEST PROPERTY LINE @ STMH 1, 1A, 2, 3
(NO SCALE)



INSTALLATION RECOMMENDATIONS ARE ALSO SPECIFIED IN INSTALLATION GUIDE 1.05: WATERSTOP INSTALLATION

PIPE SIZE (IN)	PIPE OD (IN) A-PROFILE	PIPE OD (IN) H-PROFILE	"A" MIN. HOLE ø (IN)	"B" MIN. DISTANCE PIPE INVERT TO STRUCUTRE INVERT (IN)	MANUFACTURER'S PRODUCT CODE
12	14.5	14.2	19.50	3.7	1202PS
15	17.6	17.8	23.00	4.0	1502PS
18	21.2	21.5	26.50	4.2	1802PS
24	27.8	28.4	33.25	4.5	2402PS
30	35.1	35.5	40.50	5.2	3002PS
36	41.1	41.4	47.00	5.5	3602PS
42	47.7	48.0	53.00	5.7	4202PS
48	53.6	54.0	59.00	5.7	4802PS
60	66.3	67.3	72.00	6.4	6002PS

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THIS DETAIL BASED ON INFORMATION PROVIDED TO ADS. THIS DRAWING IS INTENDED TO DEPICT THE COMPONENTS AS REQUESTED. ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN SERVICES FOR THIS PROJECT, NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS PROVIDED HEREIN ARE GENERAL RECOMMENDATIONS AND ARE NOT SPECIFIC FOR THIS PROJECT. THE DESIGN ENGINEER SHALL REVIEW THESE DETAILS PRIOR TO CONSTRUCTION. IT IS THE DESIGN ENGINEERS RESPONSIBILITY TO ENSURE THE DETAILS PROVIDED HEREIN MEETS OR EXCEEDS THE APPLICABLE NATIONAL, STATE, OR LOCAL REQUIREMENTS AND TO ENSURE THAT THE DETAILS PROVIDED HEREIN ARE ACCEPTABLE FOR THIS PROJECT.

WATERSTOP STRUCTURE CONNECTION DETAIL
(NO SCALE)

ADS ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OHIO 43026

DRAWN BY: ABC | DATE: DATE | CK'D BY: ENG | SCALE: NTS | SHEET OF

COMMONWEALTH OF VIRGINIA
DAVID R. BUTLER
Lic. No. 38395
10-2-13
PROFESSIONAL ENGINEER

DATE	COMMENT

REVISION SCHEDULE

DETAILS AND NOTES
PORTSMOUTH TERMINAL FACILITY

PROJECT LOCATED IN: VIRGINIA BEACH, VIRGINIA			MADE FOR: PER PROPERTIES
DESIGN BY: DRB	DRAWN BY: JB	CHECKED BY: DRB	DATE: OCTOBER 2, 2013
GALLUP SURVEYORS & ENGINEERS, LTD. 323 FIRST COLONIAL ROAD VIRGINIA BEACH, VIRGINIA 23454 (757)428-8132 (757)425-2390 FAX			SCALE: N/A
			FILE NO.: .

SHEET 9/13
C7

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